In the Claims

1. (Currently Amended) In a computerized 3D graphical image rendering system for performing visible surface determination, a method of generating depth information, comprising:

representing depth information by a piecewise ~~analytical~~ function, each piece of the piecewise ~~analytical~~ function comprising an analytical function defining an area in an (x,y) space and representing depth information for the area of the (x,y) space;

upon receiving a primitive object, dividing the primitive object according to areas defined by at least one analytical function, each analytical function representing depth information for the area of the primitive object;

performing a visibility test based on depth information for the areas; and

updating the piecewise ~~analytical~~ function based on the results of the visibility test, wherein at least one analytical function of the piecewise function is a non-linear function.

2. (Currently Amended) The method of claim 1 wherein each piece of the piecewise ~~analytical~~ function is an analytical function ~~of a predefined class~~ defined by corresponding parameters.

3. (Currently Amended) The method of claim ~~2~~ 1 wherein ~~the~~ at least one analytical function of the piecewise function is a linear function.

4. (Canceled)

5. (Previously Presented) The method of claim 1 wherein performing a visibility test is accomplished by using a dynamic search structure to access overlapping areas.

6. (Previously Presented) The method of claim 5 wherein the dynamic search structure is a tree-based structure.

7. (Currently Amended) The method of claim 1 wherein each piece of the piecewise ~~analytical~~ function is defined on a segment of a scanline.

8. (Currently Amended) An apparatus for generating depth information for a 3D image, comprising:

a first module configured to represent depth information for the 3D image by a piecewise ~~analytical~~ function, each piece of the piecewise ~~analytical~~ function comprising an analytical function defining an area in an (x,y) space and representing depth information for the area of the (x,y) space;

a second module configured to divide a primitive object according to areas defined by at least one analytical function upon receiving the primitive object, each analytical function representing depth information for the area defined by the analytical function;

a third module configured to perform a visibility test based on depth information for the areas; and

a fourth module configured to update the piecewise ~~analytical~~ function based on any results of the visibility test, wherein at least one analytical function of the piecewise function is a non-linear function.

9. (Canceled)

10. (Currently Amended) The apparatus of claim 8 wherein ~~the~~ at least one analytical function of the piecewise function is a ~~piecewise~~ linear function.

11. (Canceled)

12. (Currently Amended) The apparatus of claim 8 further comprising a module implementing a dynamic search structure for selectively accessing a set of piecewise ~~analytical~~ function parameters.

13. (Original) The apparatus of claim 12 wherein the dynamic search structure is a tree-based structure.

14. (Currently Amended) The apparatus of claim 8 wherein each piece of the piecewise ~~analytical~~ function is defined on a segment of a scanline.

15. (Currently Amended) An apparatus for performing visible surface determination of a 3D image defined by a plurality of primitive objects and associated depth information, comprising:

a span generator configured to generate at least one span for each of the primitive objects, each span corresponding to a horizontal scan line occupied by the primitive object, the span characterized by position data and depth data; and

a visible surface determination module responsive to the depth data associated with each of the spans and configured to determine at least one visible segment for each of the spans by comparing the depth information for the span with depth information for at least one area in an (x,y) space, each area in the (x,y) space represented by a piece of a piecewise ~~analytical~~ function, each piece of the piecewise ~~analytical~~ function comprising an analytical function representing depth data for the area in the (x,y) space, and for generating position data corresponding to each of the visible segments, wherein at least one analytical function of the piecewise function is a non-linear function.

16. (Previously Presented) The apparatus of claim 15 further comprising a storage module configured to store the position data corresponding to each of the visible segments and to store depth data corresponding to each of the visible segments.

17. (Currently Amended) A system for performing visible surface determination on a 3D image defined by a plurality of primitive objects and associated depth information, comprising:

a processing device;

a display device coupled to the processing device and configured to display the 3D image;

a graphics engine coupled to the processing device and configured to generate at least one span for each of the primitive objects and to perform visual surface determination by comparing depth information for at least one span with depth information for areas in an (x,y) space, each area in the (x,y) space defined by a piece of a piecewise ~~analytical~~ function, each piece of the piecewise ~~analytical~~ function comprising an analytical function representing depth information for the area in the (x,y) space, wherein at least one analytical function of the piecewise function is a non-linear function; and

a storage device configured to store results of the visible surface determination.

18. (Previously Presented) The system of claim 17 wherein the graphics engine further comprises a span generator configured to generate spans for each primitive object corresponding to horizontal scanlines of the primitive object.

19. (Previously Presented) The system of claim 18 wherein the graphics engine further comprises a visible surface determination module coupled to the span generator, the visible surface determination module configured to determine at least one visible segment for each span.

20. (Previously Presented) The system of claim 17 wherein the storage device stores the results of the visual surface determination in a linked-list format.

21. (Previously Presented) The system of claim 17 wherein the storage device stores the results of the visual surface determination in a binary tree format.

22. (Previously Presented) The system of claim 17 wherein the results of the visual surface determination comprise information indicative of relative depth of a first visible segment in relation to a second visible segment.

23. (Currently Amended) A computer readable medium having embodied thereon a program, the program being executable by a machine to perform method steps for performing visible surface determination on a 3D image, the method steps comprising:

representing depth information of the 3D image by a piecewise ~~analytical~~ function, each piece of the piecewise ~~analytical~~ function ~~for the 3D image~~ comprising an analytical function defining an area in an (x,y) space and representing depth information for the area in the (x,y) space;

dividing a primitive object according to areas defined by at least one analytical function, each analytical function representing depth information for the area defined by the analytical function;

performing a visibility test based on depth information for the areas; and

updating the piecewise ~~analytical~~ function based on the results of the visibility test, wherein at least one analytical function of the piecewise function is a non-linear function.

24. (Currently Amended) A system for performing visible surface determination on a 3D image defined by a plurality of primitive objects and associated depth information, comprising:

means for representing depth information by a piecewise ~~analytical~~ function, each piece of the piecewise ~~analytical~~ function ~~for the 3D image~~ comprising an analytical function defining an area in an (x,y) space and representing depth information for the area of the (x,y) space;

upon receiving a primitive object, means for dividing the primitive object according to areas defined by at least one analytical function, each analytical function representing depth information for the area defined by the analytical function;

means for performing a visibility test based on depth information for the areas; and

means for updating the piecewise ~~analytical~~ function based on the results of the visibility test, wherein at least one analytical function of the piecewise function is a non-linear function.

25. (Currently Amended) In a computerized 3D graphical image rendering system for performing visual surface determination, a method of generating depth information, comprising the steps of:

upon receiving a primitive object, dividing the primitive object into areas in an (x,y) space, the areas delimited by splits, each split defined by an analytical function, each area defined by a piece of a piecewise ~~analytical~~ function, each piece of the piecewise ~~analytical~~ function comprising an analytical function representing depth information for the area of the primitive object, wherein at least one analytical function of the piecewise function is a non-linear function; and

performing a visibility test based on the depth information for the areas.

26. (Canceled)

27. (Previously Presented) The method of claim 1 wherein performing a visibility test further comprises determining visible portions of the primitive object.

28. (Previously Presented) The method of claim 1 wherein performing a visibility test further comprises determining intersection points for at least two of the analytical functions to determine visible portions of the primitive object.

29. (Previously Presented) The method of claim 28 wherein performing a visibility test further comprises:

solving a system of at least two analytical functions to determine intersection points; and

determining visible portions of the primitive objects based on the intersection points.

30. (Previously Presented) The method of claim 1 wherein each area is a region.

31. (Previously Presented) The method of claim 1 wherein each area is a span.

32. (Currently Amended) The ~~method~~ apparatus of claim 8 wherein each area is a region.

33. (Currently Amended) The ~~method~~ apparatus of claim 8 wherein each area is a span.